

origin exists, and its magnitude is equal to 1 plus two times of the minimal interval between basic pulses.

So it can be concluded that the LA-CDMA code group that is designed according to this invention can control and in some embodiments minimize the side lobes of the auto-correlation and cross-correlation function. This enables the CDMA system to control and minimize MAI and ISI simultaneously.

Table 1 and Table 2 below respectively list minimum periods of LA-CDMA codes of 16 basic pulses and 32 basic pulses under the conditions of various minimal basic pulse intervals, in order to make it convenient for choosing.

Table 1  
Periods and minimum intervals  
of 16-pulse LA-CDMA codes

minimum interval	minimum period	Minimum Interval	minimum period	minimum interval	minimum period	minimum interval	minimum period
38	847	40	897	42	905	44	923
46	959	48	995	50	1065	52	1049
54	1081	56	1117	58	1145	60	1179
62	1213	64	1247	66	1269	68	1303
70	1337	72	1379	74	1395	76	1427
78	1461	80	1495	82	1529	84	1563
86	1587	88	1619	90	1653	92	1683
94	1715	96	1749	98	1783	100	1811
102	1843	104	1875	106	1907	108	1939
110	1971	112	2003	114	2035	116	2067
118	2099	120	2131	122	2163	124	2195

minimum interval	minimum period	Minimum Interval	minimum period	minimum interval	minimum period	minimum interval	minimum period
126	2227	128	2259	130	2291	132	2323
134	2355	136	2387	138	2419	140	2451
142	2483	144	2515	146	2547	148	2579
150	2611	152	2643	154	2675	156	2707
158	2739	160	2771	162	2803	164	2835
166	2867	168	2899	170	2931	172	2963
174	2995	176	3027	178	3059	180	3091
182	3123	184	3155	186	3187	188	3219
190	3251	192	3283	194	3315	196	3347
198	3379	200	3411	202	3443	204	3475
206	3507	208	3539	210	3571	212	3603
214	3635	216	3667	218	3699	220	3731
222	3763	224	3795	226	3827	228	3859
230	3891	232	3923	234	3955	236	3987
238	4019	240	4051	242	4083	244	4115
246	4147	248	4179	250	4211	252	4243
254	4275	256	4307				

Table 2  
Periods and minimum intervals  
of 32-pulse LA-CDMA codes

minimum interval	minimum period	minimum interval	minimum period	minimum interval	minimum period	minimum interval	minimum period
32	4751	34	4465	36	4447	38	4489
40	4745	42	4847	44	4889	46	5359
48	4699	50	5225	52	5125	54	5117
56	5315	58	4725	60	4687	62	4765
64	4423	66	5115	68	5059	70	5307
72	5299	74	5617	76	4955	78	5133
80	4915	82	5397	84	5499	86	4965

minimum interval	minimum period	minimum interval	minimum period	minimum interval	minimum period	minimum interval	minimum period
88	5291	90	5223	92	4837	94	5539
96	5889	98	5373	100	5319	102	5051
104	5331	106	5617	108	5991	110	5109
112	5347	114	5383	116	5127	118	4883
120	5211	122	5429	124	5737	126	5663
128	5725	130	5623	132	5725	134	5497
136	5323	138	5393	140	5465	142	5811
144	5959	146	5893	148	6331	150	6355
152	5943	154	6053	156	6075	158	6241
160	6425	162	6475	164	6267	166	6399
168	6517	170	6435	172	6491	174	6555
176	6631	178	6665	180	6751	182	6835
184	6839	186	6903	188	6971	190	7059
192	7121	194	7295	196	7521	198	7351
200	7543	202	7427	204	7521	206	7579
208	7629	210	7689	212	7739	214	7807
216	7875	218	7953	220	8031	222	8051
224	8119	226	8173	228	8239	230	8307
232	8375	234	8443	236	8499	238	8569
240	8641	242	8743	244	8747	246	8813
248	8881	250	8949	252	9011	254	9113
256	9173						

Pulse duty ratio for basic the LA-CDMA code is very low. For example, Figure 1 shows that pulse duty ratio of a 16 basic pulse code with period of 847 is merely  $16/847$  ( $=0.0189$ ). To increase the duty ratio in a practical design, any pulse compression codes with good performance such as a Barker sequence or linear frequency modulation